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Description

[Technical Field]

[0001] The present invention generally relates to remote SIM provisioning in telecommunication systems and more particularly relates to a system and method for performing integrated mobile number portability and remote SIM provisioning.

[Background Art]

[0002] To meet the demand for wireless data traffic having increased since deployment of 4th generation (4G) communication systems, efforts have been made to develop an improved 5th generation (5G) or pre-5G communication system. The 5G or pre-5G communication system is also called a 'beyond 4G network' or a 'post long term evolution (LTE) system'. The 5G communication system is considered to be implemented in higher frequency (mmWave) bands, e.g., 60 GHz bands, so as to accomplish higher data rates. To decrease propagation loss of the radio waves and increase the transmission distance, beamforming, massive multiple-input multiple-output (MIMO), full dimensional MIMO (FD-MIMO), array antenna, analog beamforming, and large scale antenna techniques are discussed with respect to 5G communication systems. In addition, in 5G communication systems, development for system network improvement is under way based on advanced small cells, cloud radio access networks (RANs), ultra-dense networks, device-to-device (D2D) communication, wireless backhaul, moving network, cooperative communication, coordinated multi-points (CoMP), reception-end interference cancellation and the like. In the 5G system, hybrid frequency shift keying (FSK) and Feher's quadrature amplitude modulation (FQAM) and sliding window superposition coding (SWSC) as an advanced coding modulation (ACM), and filter bank multi carrier (FBMC), non-orthogonal multiple access (NOMA), and sparse code multiple access (SCMA) as an advanced access technology have been developed.

[0003] The Internet, which is a human centered connectivity network where humans generate and consume information, is now evolving to the Internet of things (IoT) where distributed entities, such as things, exchange and process information without human intervention. The Internet of everything (IoE), which is a combination of the IoT technology and the big data processing technology through connection with a cloud server, has emerged. As technology elements, such as "sensing technology", "wired/wireless communication and network infrastructure", "service interface technology", and "security technology" have been demanded for IoT implementation, a sensor network, a machine-to-machine (M2M) communication, machine type communication (MTC), and so forth have been recently researched. Such an IoT environment may provide intelligent Internet technology serv-

ices that create a new value to human life by collecting and analyzing data generated among connected things. IoT may be applied to a variety of fields including smart home, smart building, smart city, smart car or connected cars, smart grid, health care, smart appliances and advanced medical services through convergence and combination between existing information technology (IT) and various industrial applications.

[0004] In line with this, various attempts have been made to apply 5G communication systems to IoT networks. For example, technologies such as a sensor network, MTC, and M2M communication may be implemented by beamforming, MIMO, and array antennas. Application of a cloud RAN as the above-described big data processing technology may also be considered to be as an example of convergence between the 5G technology and the IoT technology.

As described above, various services can be provided according to the development of a wireless communication system, and thus a method for easily providing such services is required.

[Disclosure]

[Technical Solution]

[0005] The present invention discloses a system and method of performing integrated mobile number portability (MNP) and remote SIM provisioning (RSP) as defined in the appended claims.

[Description of Drawings]

[0006] The other objects, features and advantages will occur to those skilled in the art from the following description of the preferred embodiment and the accompanying drawings in which:

Fig. 1 is a schematic block diagram illustrating a system view of a user triggering a subscription request to a recipient Business Support System (BSS) to perform integrated mobile number portability (MNP) and remote SIM provisioning (RSP), according to an embodiment of the present invention.

Fig. 2 illustrates a schematic flow diagram illustrating a SM-DS initiated method of performing integrated MNP and remote SIM provisioning (RSP), according to an embodiment of the present invention.

Fig. 3 illustrates a schematic flow diagram illustrating LPA unit-initiated method of performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention.

Fig. 4 illustrates a schematic flow diagram illustrating SM-DS initiated and decentralized method of performing integrated MNP and remote SIM provision-

ing, according to an embodiment of the present invention.

Fig. 5 illustrates a schematic flow diagram illustrating LPA unit-initiated and decentralized method of performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention.

Fig. 6 illustrates a schematic diagram illustrating a system undergoing transitions while performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention.

Fig. 7 illustrates a block diagram illustrating the structure of a preferred device according to another embodiment of the present disclosure.

[0007] Although specific features of the present invention are shown in some drawings and not in others, this is done for convenience only as each feature may be combined with any or all of the other features in accordance with the present invention.

[0008] In the following specification, Figs. 1, 3 and 5 concern the claimed embodiment while the remaining figures serve as additional information and examples.

[Best Mode]

[0009] Various embodiments of the present invention disclose a method of performing integrated mobile number portability (MNP) and remote SIM provisioning.

[0010] According to a first aspect of the present invention there is provided a method, performed by user equipment, UE, of managing mobile number portability, MNP, in a wireless communication system, the method comprising: transmitting a request for a unique porting code, UPC, to a first operator server to which the UE is subscribed; transmitting, to a second operator server to which the UE intends to subscribe, subscription request information generated based on the UPC, wherein the subscription request information is used for initiating a mobile number portability, MNP, procedure; receiving, from the second operator server, an update of porting time information determined based on the MNP procedure; and deleting a profile related to the first operator server upon an activation of a subscription to the second operator server and a deactivation of a subscription to the first operator server; transmitting a message requesting completion of the subscription procedure to a subscription manager-discovery server, SM-DS and downloading from the SM-DP a mobile network operator, MNO, profile.

[0011] Preferably, the subscription request information comprises at least one of a mobile network code, MNC, a mobile country code, MCC, a mobile station international subscriber directory number, MSISDN, or the UPC.

[0012] Preferably, the porting time information is de-

termined by the second operator server or an MNP clearing house administrator, MCHA.

[0013] Preferably, the first operator server is deactivated for the UE and the second operator server is activated for the UE.

[0014] Another aspect of the present disclosure is a method, performed by a subscription manager-discovery server, SM-DS, of managing mobile number portability, MNP, in a wireless communication system, the method comprising: receiving, from a subscription manager-data preparation, SM-DP, server, MNP information generated based on a subscription request of user equipment, UE, the MNP information comprising a unique porting code, UPC, to a first operator server to which the UE is subscribed; initiating, based on the UPC, a mobile number portability, MNP, procedure to a second operator server; receiving from the second operator server, porting time information of the UE determined based on the MNP procedure, after an MNP clearance and settlement is performed between the first operator server and the second operator server; receiving, from the UE, a message requesting completion of the subscription request; and transmitting, to the second operator server, a request for mapping a profile generated by the SM-DP server to a profile related to the first operator server.

[0015] Preferably, the MNP information comprises at least one of a mobile network code, MNC, a mobile country code, MCC, or mobile station international subscriber directory number, MSISDN.

[0016] Preferably, the porting time information is determined by the second operator server or an MNP clearing house administrator, MCHA.

[0017] Preferably, the UE is updated according to the profile generated by the SM-DP server, and wherein the first operator server is deactivated for the UE and the second operator server is activated for the UE.

[0018] Another aspect of the present disclosure is a user equipment, UE, for managing mobile number portability, MNP, in a wireless communication system, the UE comprising: a memory; a transceiver; and at least one processor connected to the transceiver and configured to: transmit a request for a unique porting code, UPC, to a first operator server to which the UE is subscribed; transmit, to a second operator server to which the UE intends to subscribe, subscription request information generated based on the UPC, wherein the subscription request information is used for initiating a mobile number portability, MNP, procedure; receive, from the second operator server, an update of porting time information determined based on the MNP procedure; delete a profile related to the first operator server upon an activation of a subscription to the second operator server and a deactivation of a subscription to the first operator server; and transmit a message requesting completion of the subscription procedure to a subscription manager-discovery server, SM-DS and downloading a created recipient MNO profile from the SM-DP.

[0019] Preferably, the porting time information is de-

terminated by the second operator server or an MNP clearing house administrator, MCHA.

[0020] Preferably, the first operator server is deactivated for the UE and the second operator server is activated for the UE.

[0021] Another aspect of the present disclosure is a subscription manager-discovery server, SM-DS, for managing mobile number portability, MNP, in a wireless communication system, the SM-DS comprising: a memory; a transceiver; and at least one processor connected with the transceiver and configured to: receive MNP information generated based on a subscription request of user equipment, UE, from a subscription manager-data preparation, SM-DP, server, the MNP information comprising a unique porting code, UPC, to a first operator server to which the UE is subscribed; initiate, based on the UPC, a mobile number portability, MNP, procedure to a second operator server; receive, from the second operator server, porting time information of the UE determined based on the MNP procedure, after an MNP clearance and settlement is performed between the first operator server and the second operator server; receive, from the UE, a message requesting completion of the subscription request; and transmit, to the second operator server, a request for mapping a profile generated by the SM-DP server to a profile related to the first operator server.

[0022] The foregoing has outlined, in general, the various aspects of the invention and is to serve as an aid to better understand the more complete detailed description which is to follow. In reference to such, there is to be a clear understanding that the present invention is not limited to the method or application of use described and illustrated herein. It is intended that any other advantages and objects of the present invention that become apparent or obvious from the detailed description or illustrations contained herein are within the scope of the present invention.

[Mode for Invention]

[0023] The present invention describes a system and method of performing integrated mobile number portability and remote SIM provisioning. In the following detailed description of the embodiments of the invention, reference is made to the accompanying drawings that form a part hereof, and in which are shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that changes may be made without departing from the scope of the present invention as defined by the appended claims.

[0024] The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims. The specification may refer to "an", "one" or "some" em-

bodiment(s) in several locations. This does not necessarily imply that each such reference is to the same embodiment(s), or that the feature only applies to a single embodiment. Single features of different embodiments may also be combined to provide other embodiments.

[0025] As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless expressly stated otherwise. It will be further understood that the terms "includes", "comprises", "including" and/or "comprising" when used in this specification, specify the presence of stated features, integers, steps, operations, elements and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations and arrangements of one or more of the associated listed items.

[0026] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure pertains. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0027] The embodiments herein and the various features and advantages details thereof are explained more fully with reference to the non-limiting embodiments that are illustrated in the accompanying drawings and detailed in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein can be practiced and to further enable those of skill in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting the scope of the embodiments herein.

[0028] Currently, transfer (closing and opening) of the subscription between the operators with Mobile Number Portability (MNP) is supported in many countries. MNP is done independently during switching (closing and opening) of the subscription. The operator (Mobile Network Operator (MNO)) provides access and communication services to its subscribers (user who has contract with the MNO to obtain service) through their mobile network infrastructure. Mobile Number Porting is the process of migrating mobile number (for example, MSISDN) from one MNO to another MNO. Donor Operator is the one to whose network the mobile number belongs at the time the subscriber makes a request for porting. Recipient Operator means the MNO who will be providing mobile service to the subscriber after porting.

[0029] The user initiates the process by making a request in writing to the concerned Recipient Operator in specified format. Then the recipient Operator requests

the user to obtain a Unique Porting Code (UPC) from the donor operator. A user obtains the UPC and then the user submits the UPC to the recipient operator for number porting. Then the MNP is performed with the new subscription activation between the Donor, Recipient and MNP service provider (MNP Clearing House Administrator (MCHA)) in the backend. In the present scenario, the system and method are person triggered and MNP procedure is taken forward between the operators. Further, the system and method perform semi-manual verification and activation of MNP. Further, there is no mediator for the MNP procedure and user needs to submit the request manually to both Operators and backend verification is performed by the Operators with MCHA before activation. Further, the system and method perform isolated procedure where there is subscription change and MNP are isolated.

[0030] In case of remote SIM provisioning, since MSISDN is an essential part for the Subscription and it is required well in advance for preparation of the profile and before provisioning in to the eUICC, so that activation of subscription is done successfully and user is reachable with the MSISDN number. In case, if the remote SIM provisioning needs to support MNP, then there is a need for new mechanism to sequence the MNP procedure along with Remote provisioning to allow user to persist the existing the mobile number with the recipient operator and/or to minimize the no service time. In the present scenario, initiation of the porting process is an off-line administrative process and cannot be invoked via a specific Man Machine Interface (MMI) on the hand-set, where as remote SIM provisioning procedure is initiated on the hand-set. Accordingly, there remains a need for the system and method to perform integrated mobile number portability and remote SIM provisioning with less manual intervention.

The above-mentioned shortcomings, disadvantages and problems are addressed herein and which will be understood by reading and studying the following specification.

[0031] Fig. 1 is a schematic block diagram illustrating a system view of a user 102 triggering a subscription request to a recipient Business Support System (BSS) 106 to perform integrated mobile number portability (MNP) and remote SIM provisioning (RSP), according to an embodiment of the present invention. The system includes the recipient BSS 106, a donor BSS 112, a Recipient Subscription Manager-Data Preparation (SM-DP) 108, Subscription Manager-Discovery Server (SM-DS) 110, the user equipment (UE) 104 and a recipient Home Subscriber Server (HSS). The user 102 triggers the subscription request to the recipient BSS 106 through an application configured in the user equipment (UE) 104. The applicant may be a recipient mobile network operator (MNO) application. The subscription request includes a mobile number portability indicator. The mobile number portability indicator includes a user selected plan, recipient mobile network operator (MNO) details (Mobile Network Code (MNC) and a Mobile Country Code (MCC))

and a Mobile Station International Subscriber Directory Number (MSISDN). The application retrieves the MCC, MNC and the MSISDN from the user equipment 104 to send the MNP indicator. The user equipment 104 may be one of a mobile phone, a tablet, a communication device (e.g. smart watches, etc.) and a personal digital assistance. The UE 104 includes an embedded Universal Integrated Circuit Card (eUICC) 116 and a local profile assistant (LPA) unit 114. The eUICC 116 includes storage space adapted to hold one or more profiles of different mobile network operators (MNO).

[0032] The recipient BSS 106 sends the subscription request to a recipient Subscription Manager-Data Preparation (SM-DP) 108 by initiating the remote SIM provisioning upon receipt of the subscription request. The recipient BSS 106 forwards the subscription request to the recipient SM-DP 108 by sending Download Order followed by Confirm Order message. The recipient BSS 106 analyzes the subscription request and determines that the subscription request is a request for the MNP when the subscription request having the recipient MNO details and the MSISDN. The recipient BSS 106 further sends the recipient MNO details (MNC and MCC) for the MNP, UPC and MSISDN with a confirm order message to the recipient SM-DP 108 based on a response received from the recipient SM-DP 108. The recipient SM-DP 108 creates a recipient MNO profile. The recipient MNO profile includes the old MSISDN (as the user requested for the MNP). The recipient SM-DP 108 registers an MNP event including RSP event details in the SM-DS 110.

[0033] The donor BSS 112 sends a Unique Porting Code (UPC) to the LPA 114/the SM-DS 110 in response to a UPC request sent by the LPA 114/the SM-DS 110 to the donor BSS 112. The UPC has a predefined time to live (TTL) period beyond which the UPC expires. The expiry of the UPC leads to MNP expiry state or MNP termination state. The recipient BSS 106 initiates the MNP event by sending the UPC and the MSISDN to at least one of the MCHA and the donor BSS, in response to an MNP initiation request sent by the SM-DS 110 to the recipient BSS 106. The SM-DS 110 executes the MNP event with at least one of, the Donor BSS 112, the Recipient BSS 106 and the MCHA, based on the registration by the recipient SM-DP 108. The UE 104 retrieves RSP event details from the SM-DS 110 to download the recipient MNO profile from the SM-DP 108. The SM-DS 110 sends address of the appropriate recipient SM-DP to download the relevant recipient MNO profile. The LPA unit 114 within the UE 104 is adapted to download the created recipient MNO profile from the Recipient SM-DP 108. The UE 104 executes the remote SIM provisioning by transferring the eUICC 116 functioning from a donor MNO profile to the recipient MNO profile. The transfer of the eUICC 116 from the donor MNO profile to the recipient MNO profile deactivates the subscription of the UE 104 to a donor MNO and activates the subscription of the UE 104 to a recipient MNO at the porting date and time.

[0034] The system includes a clearing house administrator (MCHA) to coordinate with the recipient BSS 106 and the donor BSS 112 to execute the MNP without conflict in the MSISDN. In an embodiment, the MCHA is adapted to set a porting date and time. In another embodiment, the donor BSS 112 and the recipient BSS 106 communicates between them to set the porting date and time. The porting date and time is set once an MNP clearance and settlement is cleared between the recipient MNO and the donor MNO. The execution of the MNP event includes (a) SM-DS initiated method, (b) LPA unit-initiated method, (c) decentralized and SM-DS initiated method and (d) decentralized and LPA unit-initiated method (that as has been described in description of the following figures).

[0035] Fig. 2 illustrates a schematic flow diagram illustrating a SM-DS initiated method of performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention. At step 206, a recipient BSS 106 receives a subscription request from a user equipment 104 triggered by a user 102. In an embodiment, the user 102 triggers the subscription request through an application configured in the UE 104. The subscription request includes a mobile number portability indicator. The mobile number portability indicator includes at least one of: a user selected plan, recipient mobile network operator (MNO) details (Mobile Network Code (MNC) and a Mobile Country Code (MCC)) and a Mobile Station International Subscriber Directory Number (MSISDN).

[0036] At step 208, the recipient BSS 106 initiates the remote SIM provisioning by sending the subscription request (e.g. to create a recipient MNO profile) to a recipient Subscription Manager-Data Preparation (SM-DP) 108. The recipient BSS 106 forwards the subscription request to the recipient SM-DP 108 by sending Download Order followed by Confirm Order message to the recipient SM-DP 108. The recipient BSS 106 further receives a response from the recipient SM-DP 108 upon requesting the download order. At step 210, the recipient BSS 106 sends the details for MNP (MNC, MCC and MSISDN) with a confirm order message to the Recipient SM-DP 108 based on the response received from the recipient SM-DP 108. The recipient SM-DP 108 acknowledges receipt of the confirm order message. At step 212, the recipient SM-DP prepares a recipient MNO profile. The recipient MNO profile may include the old MSISDN (as the user requested for the MNP). At step 214, the recipient SM-DP 108 registers an MNP event in the SM-DS 110. At step 216, a donor BSS 112 sends a Unique Porting Code (UPC) to the SM-DS 110 in response to a UPC request sent by the SM-DS 110 to the donor BSS 112.

[0037] At step 218, the SM-DS 110 sends an MNP initiation request comprising the UPC and the MSISDN to the recipient BSS 106. Further an MNP Clearing house administrator (MCHA) 202 receives an MNP request from the recipient BSS 106 in response to the MNP initiation request sent by the SM-DS 110 to the recipient BSS 106.

At step 220, an MNP clearance is received by the MCHA 202 from the donor BSS 112 in response to an MNP clearance request sent by the MCHA 202 to the donor BSS 112. At step 222, the MCHA sets a porting date and time to execute the MNP event. At step 224, the MCHA communicates the porting date and time to (a) the donor BSS 112 for deactivation of subscription of the UE to a donor MNO and (b) the recipient BSS 106 for activation of the subscription of the UE to a recipient MNO. At step 226, the recipient BSS 106 communicates the porting date and time to the SM-DS 110. The recipient BSS 106 further communicates the porting date and time to the UE 104. At step 228, the SM-DS 110 sends an event ready message to the recipient SM-DP 108 upon receipt of the porting date and time. The recipient SM-DP 108 communicates a profile ready message to the recipient BSS 106 upon receipt of the event ready message from the SM-DS 110.

[0038] At step 230, the donor BSS 112 deactivates the subscription of the UE 104 from the donor MNO and the recipient BSS 106 activates the subscription of the UE 104 to the recipient MNO. The LPA 114 within the UE 104 deletes donor MNO profile upon activation of the subscription of the UE 104 to the recipient MNO. At step 232, the UE 104 sends an event retrieve request to the SM-DS 110. On receiving the response (Event Request Confirm), which may include the completion of the MNP, from the SM-DS 110, the UE 104 downloads the created recipient MNO profile from the SM-DP 108 and transfers an embedded universal integrated circuit card (UICC) functioning from the donor MNO profile to the recipient MNO profile. The SM-DS 110 sends a profile mapping request to the recipient BSS 106 to map the recipient MNO profile onto the donor MNO profile to enable activation of the subscription of the UE 104 to the recipient MNO. At step 234, the recipient BSS 106 sends an MSISDN mapping request to a recipient Home Subscriber Server (204) to enable the MNP and establish communication via the recipient MNO.

[0039] Fig. 3 illustrates a schematic flow diagram illustrating LPA unit-initiated method of performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention. At step 302, a donor BSS 112 provides a Unique Porting Code (UPC) to a UE 104 in response to a UPC request sent by the UE 104 to the donor BSS 112. At step 304, a recipient BSS 106 receives a subscription request from the user equipment 104 triggered by a user 102. In an embodiment, the user 102 triggers the subscription request through an application configured in the UE 104. The subscription request includes a mobile number portability indicator. The mobile number portability indicator includes a user selected plan, recipient mobile network operator (MNO) details (Mobile Network Code (MNC) and a Mobile Country Code (MCC)), a Mobile Station International Subscriber Directory Number (MSISDN) and the UPC. The MNP indicator includes mobile network code (MNC) and mobile country code (MCC).

[0040] At step 306, the recipient BSS 106 initiates the remote SIM provisioning by sending the subscription request (e.g. to create a recipient MNO profile) to a recipient Subscription Manager-Data Preparation (SM-DP) 108. The recipient BSS 106 forwards the subscription request to the recipient SM-DP 108 by sending Download Order followed by Confirm Order message. The recipient BSS 106 further receives a response from the recipient SM-DP 108 upon requesting the download order. At step 308, the recipient BSS 106 sends the details of the MNP (MNC, MCC, MSISDN and UPC) with a confirm order message to the Recipient SM-DP 108 based on the response received from the recipient SM-DP 108. The recipient SM-DP 108 acknowledges receipt of the confirm order message. At step 310, the recipient SM-DP 108 prepares the recipient MNO profile. The recipient MNO profile includes the old MSISDN (as the user requested for the MNP). At step 312, the recipient SM-DP 108 registers an MNP event in the SM-DS 110. The registration of the MNP event includes details of the MNC, MCC, MSISDN and UPC.

[0041] At step 314, the SM-DS 110 sends an MNP initiation request comprising the UPC and the MSISDN to the recipient BSS 106. Further an MNP Clearing house administrator (MCHA) 202 receives an MNP request from the recipient BSS 106 in response to the MNP initiation request sent by the SM-DS 110 to the recipient BSS 106. At step 316, an MNP clearance is received from the donor BSS 112 in response to an MNP clearance request sent by the MCHA 202 to the donor BSS 112. At step 318, the MCHA 202 sets a porting date and time to execute the MNP event. At step 320, the MCHA 202 communicates the porting date and time to (a) the donor BSS 112 for deactivation of subscription of the UE to a donor MNO and (b) the recipient BSS 106 for activation of the subscription of the UE to a recipient MNO. At step 322, the recipient BSS 106 communicates the porting date and time to the SM-DS 110. The recipient BSS 106 further communicates the porting date and time to the UE 104. At step 324, the SM-DS 110 sends an event ready message to the recipient SM-DP 108 upon receipt of the porting date and time. The recipient SM-DP 108 communicates a profile ready message to the recipient BSS 106 upon receipt of the event ready message from the SM-DS 110.

[0042] At step 326, the donor BSS 112 deactivates the subscription of the UE 104 to the donor MNO and the recipient BSS 106 activates the subscription of the UE 104 to the recipient MNO at the porting date and time. The LPA 114 within the UE 104 deletes donor MNO profile upon activation of the subscription of the UE 104 to the recipient MNO. At step 328, the UE 104 sends an event retrieve request to the SM-DS 110. On receiving the response (Event Request Confirm), which may include the completion of the MNP, from the SM-DS 110, the UE 104 downloads the created recipient MNO profile from the SM-DP 108 to transfer an embedded universal integrated circuit card (UICC) functioning from the donor

MNO profile to the recipient MNO profile. The UE 104 then sends an MNP completion indication to the SM-DS 110. At step 330, the SM-DS 110 sends a profile mapping request to the recipient BSS 106 to map the recipient MNO profile onto the donor MNO profile to enable activation of the subscription of the UE 104 to the recipient MNO. The recipient BSS 106 sends an MSISDN mapping request to a recipient Home Subscriber Server 204 to enable the MNP and establish communication via the recipient MNO.

[0043] Fig. 4 illustrates a schematic flow diagram illustrating decentralized and SM-DS initiated method of performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention. At step 402, a recipient BSS 106 receives a subscription request from a user equipment 104 triggered by a user. In an embodiment, the user triggers the subscription request through an application configured in the UE 104. The subscription request includes a mobile number portability indicator. The mobile number portability indicator includes a user selected plan, recipient mobile network operator (MNO) details (Mobile Network Code (MNC) and a Mobile Country Code (MCC)) and a Mobile Station International Subscriber Directory Number (MSISDN). The MNP indicator includes mobile network code (MNC) and mobile country code (MCC).

[0044] At step 404, the recipient BSS 106 initiates the remote SIM provisioning by sending the subscription request (e.g. to create a recipient MNO profile) to a recipient Subscription Manager-Data Preparation (SM-DP) 108. The recipient BSS 106 forwards the subscription request to the recipient SM-DP 108 by sending Download Order followed by Confirm Order message. The recipient BSS 106 receives a response from the recipient SM-DP 108 upon requesting the download order. At step 406, the recipient BSS 106 sends the details for MNP (MNC, MCC and MSISDN) with a confirm order message to the recipient SM-DP 108 based on the response received from the recipient SM-DP 108. The recipient SM-DP 108 acknowledges receipt of the confirm order message. At step 408, the recipient SM-DP prepares a recipient MNO profile. The recipient MNO profile includes the old MSISDN (as the user requested for the MNP). At step 410, the recipient SM-DP 108 registers an MNP event in the SM-DS 110. At step 412, a donor BSS 112 sends a Unique Porting Code (UPC) to the SM-DS 110 in response to a UPC request sent by the SM-DS 110 to the donor BSS 112.

[0045] At step 414, the SM-DS 110 sends an MNP initiation request comprising the UPC and the MSISDN to the recipient BSS 106 upon receipt of the UPC. The recipient BSS 106 sends an MNP request comprising the UPC and the MSISDN to the donor BSS 112 upon receipt of the MNP initiation request from the SM-DS 110. At step 416, the donor BSS 112 and the recipient BSS 106 communicates between each other to obtain MNP clearance and settlement. At step 418, the donor BSS 112 and the recipient BSS 106 communicates between each

other to set porting date and time once the MNP clearance and settlement is obtained. At step 420, the recipient BSS 106 communicates the porting date and time to the UE 104 and the SM-DS 110. At step 422, the SM-DS 110 sends an event ready message to the recipient SM-DP 108. The recipient SM-DP 108 sends a profile ready message to the recipient BSS 106 upon receipt of the profile ready message.

[0046] At step 424, the donor BSS 112 deactivates subscription of the UE to a donor MNO and the recipient BSS 106 activates the subscription of the UE to a recipient MNO at the porting date and time. The LPA 114 within the UE 104 deletes a donor MNO profile upon activation of the subscription of the UE 104 to the recipient MNO. At step 426, the UE 104 sends an event retrieve request to the SM-DS 110. On receiving the response (Event Request Confirm), which may include the completion of the MNP, from the SM-DS 110, the UE 104 downloads the created recipient MNO profile from the SM-DP 108 to transfer an embedded universal integrated circuit card (UICC) functioning from the donor MNO profile to the recipient MNO profile. At step 428, the SM-DS 110 sends a profile mapping request to the recipient BSS 106 to map the recipient MNO profile onto the donor MNO profile to enable activation of the subscription of the UE 104 to the recipient MNO. The recipient BSS 106 sends an MSISDN mapping request to a recipient Home Subscriber Server 204 to enable the MNP and establish communication via the recipient MNO.

[0047] Fig. 5 illustrates a schematic flow diagram illustrating decentralized and LPA unit-initiated method of performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention. At step 502, a donor BSS 112 provides a Unique Porting Code (UPC) to a UE 104 in response to a UPC request sent by the UE 104 to the donor BSS 112. At step 504, a recipient BSS 106 receives a subscription request from the user equipment 104 triggered by a user 102. In an embodiment, the user 102 triggers the subscription request through an application configured in the UE 104. The subscription request includes a mobile number portability indicator. The mobile number portability indicator includes a user selected plan, recipient mobile network operator (MNO) details (Mobile Network Code (MNC) and a Mobile Country Code (MCC)), a Mobile Station International Subscriber Directory Number (MSISDN) and the UPC. The MNP indicator includes mobile network code (MNC) and mobile country code (MCC).

[0048] At step 506, the recipient BSS 106 initiates the remote SIM provisioning by sending the subscription request (e.g. to create a recipient MNO profile) to a recipient Subscription Manager-Data Preparation (SM-DP) 108. The recipient BSS 106 forwards the subscription request to the recipient SM-DP 108 by sending Download Order followed by Confirm Order message. The recipient BSS 106 further receives a response from the recipient SM-DP 108 upon requesting the download order. At step 508, the recipient BSS 106 sends the details of the MNP

(MNC, MCC, MSISDN and UPC) with a confirm order message to the Recipient SM-DP 108 based on the response received from the recipient SM-DP 108. The recipient SM-DP 108 acknowledges receipt of the confirm order message. At step 510, the recipient SM-DP prepares a recipient MNO profile. The recipient MNO profile may include the old MSISDN (as the user requested for the MNP). At step 512, the recipient SM-DP 108 registers an MNP event in the SM-DS 110. The registration of the MNP event includes details of the MNC, MCC, MSISDN and UPC.

[0049] At step 514, the SM-DS 110 sends an MNP initiation request comprising the UPC and the MSISDN to the recipient BSS 106 upon receipt of the UPC from the donor BSS 112. The recipient BSS 106 sends the MNP request comprising the UPC and the MSISDN to the donor BSS upon receipt of the MNP initiation request from the SM-DS 110. At step 516, the donor BSS 112 and the recipient BSS 106 communicates between each other to obtain MNP clearance and settlement. At step 518, the donor BSS 112 and the recipient BSS 106 communicates between each other to set porting date and time once the MNP clearance and settlement is obtained. At step 520, the recipient BSS 106 communicates the porting date and time to the UE 104 and the SM-DS 110. At step 522, the SM-DS 110 sends an event ready message to the recipient SM-DP 108. The recipient SM-DP 108 sends a profile ready message to the recipient BSS 106 upon receipt of the event ready message.

[0050] At step 524, the donor BSS 112 deactivates subscription of the UE 104 to a donor MNO and the recipient BSS 106 activates the subscription of the UE 104 to a recipient MNO at the porting date and time. The LPA 114 within the UE 104 deletes a donor MNO profile upon activation of the subscription of the UE 104. At step 526, the UE 104 sends an event retrieve request to the SM-DS 110. On receiving the response (Event Request Confirm), which may include the completion of the MNP, from the SM-DS 110, the UE 104 downloads the created recipient MNO profile from the SM-DP 108 to transfer an embedded universal integrated circuit card (UICC) functioning from the donor MNO profile to the recipient MNO profile. The UE 104 then sends an MNP completion indication to the SM-DS 110. At step 528, the SM-DS 110 sends a profile mapping request to the recipient BSS 106 to map the recipient MNO profile onto the donor MNO profile to enable activation of the subscription of the UE 104 to the recipient MNO. The recipient BSS 106 sends an MSISDN mapping request to a recipient Home Subscriber Server 204 to enable the MNP and establish communication via the recipient MNO.

[0051] Fig. 6 illustrates a schematic diagram illustrating a system undergoing transitions while performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention. According to this embodiment, the system undergoes a first transition from a null state to an MNP_I (MNP initiated) state. The first transition is initiated by a trigger of sending a sub-

scription request comprising an MNP indicator by a UE 104 to a recipient BSS 106. The MNP_I state indicates the initiation of the MNP performed either through SM-DS 110 or LPA 114. The system then undergoes a second transition from the MNP_I state to MNP_P (MNP processing) state. The second transition is initiated by a trigger of requesting Unique Porting Code (UPC) by one of (a) the SM-DS 110 and (b) the LPA 114 to a donor BSS 112. Porting date and Time is set upon receipt of the UPC.

[0052] The system then undergoes a third transition from the MNP_P state to MNP_R (MNP ready) state. The third transition is initiated by a trigger of receiving an MNP request from the recipient BSS 106. The recipient BSS 106 then receives a profile ready message from a recipient SM-DP 108. The system then undergoes a fourth transition from the MNP_R state to MNP_C (MNP completion) state. The fourth transition is initiated by a trigger of MNP completion request from the LPA 114 within the UE 104. The donor BSS 112 deactivates subscription of the UE 104 to a donor MNO profile. The recipient BSS 106 upon receipt of the profile ready message downloads a recipient MNO profile from the recipient SM-DP 108 and activates the subscription of the UE 104 to a recipient MNO profile. The SM-DS 110 then sends a profile mapping request to the recipient BSS 106 to map a recipient MNO profile onto a donor MNO profile. The recipient BSS 106 then sends MSISDN mapping request to a recipient HSS 204 to perform MSISDN mapping to enable the MNP.

[0053] The system may undergo sixth transition from at least one of (a) MNP_I, (b) MNP_P, (c) MNP_R and (d) MNP_C state to MNP_E (MNP expiry state). The sixth transition is initiated by a trigger of expiry of the UPC. The UPC expires beyond predefined time to live (TTL) period. The system may also undergo seventh transition from at least one of (a) MNP_I and (b) MNP_P state to MNP_T (MNP termination) state. The seventh transition is initiated by a trigger of MNP termination request received from at least one of (a) the donor BSS 112 and (b) the recipient BSS 106. The MNP termination may be due to expiry of the UPC or failure at MNP initiation level. Fig. 7 is a block diagram illustrating the structure of a preferred device according to another embodiment of the present disclosure.

[0054] Referring to the Fig. 7, the user equipment 700 may include a processor 710, a transceiver 720 and a memory 730. However, all of the illustrated components are not essential. The user equipment 104 may be implemented by more or less components than those illustrated in Fig. 7. In addition, the processor 710 and the transceiver 720 and the memory 730 may be implemented as a single chip according to another embodiment.

[0055] The aforementioned components will now be described in detail.

[0056] The processor 710 may include one or more processors or other processing devices that control the proposed function, process, and/or method. Operation

of the user equipment 104 may be implemented by the processor 710.

[0057] The processor 710 may sense each configured resource pool and/or each group of resources to obtain a result of sensing, the result of sensing containing a set of remaining candidate single TU resources of each resource pool. The processor 710 may select, from the set of remaining candidate single TU resources of each resource pool and/or each group of resources, one candidate single TU resource as a transmission resource.

[0058] The transceiver 720 may include a RF transmitter for up-converting and amplifying a transmitted signal, and a RF receiver for down-converting a frequency of a received signal. However, according to another embodiment, the transceiver 720 may be implemented by more or less components than those illustrated in components.

[0059] The transceiver 720 may be connected to the processor 710 and transmit and/or receive a signal. The signal may include control information and data. In addition, the transceiver 720 may receive the signal through a wireless channel and output the signal to the processor 710. The transceiver 720 may transmit a signal output from the processor 710 through the wireless channel.

[0060] The memory 730 may store the control information or the data included in a signal obtained by the device 700. The memory 730 may be connected to the processor 710 and store at least one instruction or a protocol or a parameter for the proposed function, process, and/or method. The memory 730 may include read-only memory (ROM) and/or random access memory (RAM) and/or hard disk and/or CD-ROM and/or DVD and/or other storage devices.

[0061] While the specification has been described in detail with respect to specific embodiments of the invention, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing, may readily conceive of alterations to, variations of, and equivalents to these embodiments. These and other modifications and variations to the present invention may be practiced by those of ordinary skill in the art, without departing from the scope of the present invention. Furthermore, those of ordinary skill in the art will appreciate that the foregoing description is by way of example only and is not intended to limit the invention. Thus, it is intended that the present subject matter covers such modifications and variations. request to the recipient SM-DP 108 by sending Download Order followed by Confirm Order message. The recipient BSS 106 receives a response from the recipient SM-DP 108 upon requesting the download order. At step 406, the recipient BSS 106 sends the details for MNP (MNC, MCC and MSISDN) with a confirm order message to the recipient SM-DP 108 based on the response received from the recipient SM-DP 108. The recipient SM-DP 108 acknowledges receipt of the confirm order message. At step 408, the recipient SM-DP prepares a recipient MNO profile. The recipient MNO profile includes the old MSISDN (as the user requested for the MNP). At step 410, the recipient SM-DP 108 registers

an MNP event in the SM-DS 110. At step 412, a donor BSS 112 sends a Unique Porting Code (UPC) to the SM-DS 110 in response to a UPC request sent by the SM-DS 110 to the donor BSS 112.

[0062] At step 414, the SM-DS 110 sends an MNP initiation request comprising the UPC and the MSISDN to the recipient BSS 106 upon receipt of the UPC. The recipient BSS 106 sends an MNP request comprising the UPC and the MSISDN to the donor BSS 112 upon receipt of the MNP initiation request from the SM-DS 110. At step 416, the donor BSS 112 and the recipient BSS 106 communicates between each other to obtain MNP clearance and settlement. At step 418, the donor BSS 112 and the recipient BSS 106 communicates between each other to set porting date and time once the MNP clearance and settlement is obtained. At step 420, the recipient BSS 106 communicates the porting date and time to the UE 104 and the SM-DS 110. At step 422, the SM-DS 110 sends an event ready message to the recipient SM-DP 108. The recipient SM-DP 108 sends a profile ready message to the recipient BSS 106 upon receipt of the profile ready message.

[0063] At step 424, the donor BSS 112 deactivates subscription of the UE to a donor MNO and the recipient BSS 106 activates the subscription of the UE to a recipient MNO at the porting date and time. The LPA 114 within the UE 104 deletes a donor MNO profile upon activation of the subscription of the UE 104 to the recipient MNO. At step 426, the UE 104 sends an event retrieve request to the SM-DS 110. On receiving the response (Event Request Confirm), which may include the completion of the MNP, from the SM-DS 110, the UE 104 downloads the created recipient MNO profile from the SM-DP 108 to transfer an embedded universal integrated circuit card (UICC) functioning from the donor MNO profile to the recipient MNO profile. At step 428, the SM-DS 110 sends a profile mapping request to the recipient BSS 106 to map the recipient MNO profile onto the donor MNO profile to enable activation of the subscription of the UE 104 to the recipient MNO. The recipient BSS 106 sends an MSISDN mapping request to a recipient Home Subscriber Server 204 to enable the MNP and establish communication via the recipient MNO.

[0064] Fig. 5 illustrates a schematic flow diagram illustrating decentralized and LPA unit-initiated method of performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention. At step 502, a donor BSS 112 provides a Unique Porting Code (UPC) to a UE 104 in response to a UPC request sent by the UE 104 to the donor BSS 112. At step 504, a recipient BSS 106 receives a subscription request from the user equipment 104 triggered by a user 102. In an embodiment, the user 102 triggers the subscription request through an application configured in the UE 104. The subscription request includes a mobile number portability indicator. The mobile number portability indicator includes a user selected plan, recipient mobile network operator (MNO) details (Mobile Network Code (MNC)

and a Mobile Country Code (MCC)), a Mobile Station International Subscriber Directory Number (MSISDN) and the UPC. The MNP indicator includes mobile network code (MNC) and mobile country code (MCC).

[0065] At step 506, the recipient BSS 106 initiates the remote SIM provisioning by sending the subscription request (e.g. to create a recipient MNO profile) to a recipient Subscription Manager-Data Preparation (SM-DP) 108. The recipient BSS 106 forwards the subscription request to the recipient SM-DP 108 by sending Download Order followed by Confirm Order message. The recipient BSS 106 further receives a response from the recipient SM-DP 108 upon requesting the download order. At step 508, the recipient BSS 106 sends the details of the MNP (MNC, MCC, MSISDN and UPC) with a confirm order message to the Recipient SM-DP 108 based on the response received from the recipient SM-DP 108. The recipient SM-DP 108 acknowledges receipt of the confirm order message. At step 510, the recipient SM-DP prepares a recipient MNO profile. The recipient MNO profile may include the old MSISDN (as the user requested for the MNP). At step 512, the recipient SM-DP 108 registers an MNP event in the SM-DS 110. The registration of the MNP event includes details of the MNC, MCC, MSISDN and UPC.

[0066] At step 514, the SM-DS 110 sends an MNP initiation request comprising the UPC and the MSISDN to the recipient BSS 106 upon receipt of the UPC from the donor BSS 112. The recipient BSS 106 sends the MNP request comprising the UPC and the MSISDN to the donor BSS upon receipt of the MNP initiation request from the SM-DS 110. At step 516, the donor BSS 112 and the recipient BSS 106 communicates between each other to obtain MNP clearance and settlement. At step 518, the donor BSS 112 and the recipient BSS 106 communicates between each other to set porting date and time once the MNP clearance and settlement is obtained. At step 520, the recipient BSS 106 communicates the porting date and time to the UE 104 and the SM-DS 110. At step 522, the SM-DS 110 sends an event ready message to the recipient SM-DP 108. The recipient SM-DP 108 sends a profile ready message to the recipient BSS 106 upon receipt of the event ready message.

[0067] At step 524, the donor BSS 112 deactivates subscription of the UE 104 to a donor MNO and the recipient BSS 106 activates the subscription of the UE 104 to a recipient MNO at the porting date and time. The LPA 114 within the UE 104 deletes a donor MNO profile upon activation of the subscription of the UE 104. At step 526, the UE 104 sends an event retrieve request to the SM-DS 110. On receiving the response (Event Request Confirm), which may include the completion of the MNP, from the SM-DS 110, the UE 104 downloads the created recipient MNO profile from the SM-DP 108 to transfer an embedded universal integrated circuit card (UICC) functioning from the donor MNO profile to the recipient MNO profile. The UE 104 then sends an MNP completion indication to the SM-DS 110. At step 528, the SM-DS 110

sends a profile mapping request to the recipient BSS 106 to map the recipient MNO profile onto the donor MNO profile to enable activation of the subscription of the UE 104 to the recipient MNO. The recipient BSS 106 sends an MSISDN mapping request to a recipient Home Subscriber Server 204 to enable the MNP and establish communication via the recipient MNO.

[0068] Fig. 6 illustrates a schematic diagram illustrating a system undergoing transitions while performing integrated MNP and remote SIM provisioning, according to an embodiment of the present invention. According to this embodiment, the system undergoes a first transition from a null state to an MNP_I (MNP initiated) state. The first transition is initiated by a trigger of sending a subscription request comprising an MNP indicator by a UE 104 to a recipient BSS 106. The MNP_I state indicates the initiation of the MNP performed either through SM-DS 110 or LPA 114. The system then undergoes a second transition from the MNP_I state to MNP_P (MNP processing) state. The second transition is initiated by a trigger of requesting Unique Porting Code (UPC) by one of (a) the SM-DS 110 and (b) the LPA 114 to a donor BSS 112. Porting date and Time is set upon receipt of the UPC.

[0069] The system then undergoes a third transition from the MNP_P state to MNP_R (MNP ready) state. The third transition is initiated by a trigger of receiving an MNP request from the recipient BSS 106. The recipient BSS 106 then receives a profile ready message from a recipient SM-DP 108. The system then undergoes a fourth transition from the MNP_R state to MNP_C (MNP completion) state. The fourth transition is initiated by a trigger of MNP completion request from the LPA 114 within the UE 104. The donor BSS 112 deactivates subscription of the UE 104 to a donor MNO profile. The recipient BSS 106 upon receipt of the profile ready message downloads a recipient MNO profile from the recipient SM-DP 108 and activates the subscription of the UE 104 to a recipient MNO profile. The SM-DS 110 then sends a profile mapping request to the recipient BSS 106 to map a recipient MNO profile onto a donor MNO profile. The recipient BSS 106 then sends MSISDN mapping request to a recipient HSS 204 to perform MSISDN mapping to enable the MNP.

[0070] The system may undergo sixth transition from at least one of (a) MNP_I, (b) MNP_P, (c) MNP_R and (d) MNP_C state to MNP_E (MNP expiry state). The sixth transition is initiated by a trigger of expiry of the UPC. The UPC expires beyond predefined time to live (TTL) period. The system may also undergo seventh transition from at least one of (a) MNP_I and (b) MNP_P state to MNP_T (MNP termination) state. The seventh transition is initiated by a trigger of MNP termination request received from at least one of (a) the donor BSS 112 and (b) the recipient BSS 106. The MNP termination may be due to expiry of the UPC or failure at MNP initiation level. Fig. 7 is a block diagram illustrating the structure of a preferred device according to another embodiment of the

present disclosure.

[0071] Referring to the Fig. 7, the user equipment 700 may include a processor 710, a transceiver 720 and a memory 730. However, all of the illustrated components are not essential. The user equipment 104 may be implemented by more or less components than those illustrated in Fig. 7. In addition, the processor 710 and the transceiver 720 and the memory 730 may be implemented as a single chip according to another embodiment.

[0072] The aforementioned components will now be described in detail.

[0073] The processor 710 may include one or more processors or other processing devices that control the proposed function, process, and/or method. Operation of the user equipment 104 may be implemented by the processor 710.

[0074] The processor 710 may sense each configured resource pool and/or each group of resources to obtain a result of sensing, the result of sensing containing a set of remaining candidate single TU resources of each resource pool. The processor 710 may select, from the set of remaining candidate single TU resources of each resource pool and/or each group of resources, one candidate single TU resource as a transmission resource.

[0075] The transceiver 720 may include a RF transmitter for up-converting and amplifying a transmitted signal, and a RF receiver for down-converting a frequency of a received signal. However, according to another embodiment, the transceiver 720 may be implemented by more or less components than those illustrated in components.

[0076] The transceiver 720 may be connected to the processor 710 and transmit and/or receive a signal. The signal may include control information and data. In addition, the transceiver 720 may receive the signal through a wireless channel and output the signal to the processor 710. The transceiver 720 may transmit a signal output from the processor 710 through the wireless channel.

[0077] The memory 730 may store the control information or the data included in a signal obtained by the device 700. The memory 730 may be connected to the processor 710 and store at least one instruction or a protocol or a parameter for the proposed function, process, and/or method. The memory 730 may include read-only memory (ROM) and/or random access memory (RAM) and/or hard disk and/or CD-ROM and/or DVD and/or other storage devices.

[0078] While the specification has been described in detail with respect to specific embodiments of the invention, the present invention is only defined and limited by the appended claims.

Claims

1. A method, performed by user equipment (104), LTE, of managing mobile number portability, MNP, in a wireless communication system, the method comprising:

- transmitting (302, 502) a request for a unique porting code, UPC, to a first operator server (112) receiving the UPC from the first operator server (112);
 transmitting (304, 504), to a second operator server (106), subscription request including a number portability indicator including a mobile network code, MNC, a mobile country code, MCC, a mobile station international subscriber directory number, MSISDN, and the UPC, wherein the subscription request is used for initiating a mobile number portability, MNP, procedure;
 receiving (322, 520), from the second operator server (106), a porting time information determined based on the MNP procedure;
 deleting a profile related to the first operator server (112) upon an activation (326, 524) of a subscription to the second operator server (106) and a deactivation (326, 524) of a subscription to the first operator server (112) based on the porting time information;
 transmitting (328, 526) a message requesting completion of the subscription procedure to a subscription manager-discovery server (110), SM-DS, and downloading from a Subscription Manager-Data Preparation server, SM-DP, (108) a mobile network operator, MNO, profile, wherein the first operator server (112) is a donor business support system, BSS, and the second operator server is a recipient BSS (106).
2. The method of claim 1, wherein the porting time information is determined by the second operator server or an MNP clearing house administrator (202), MCHA.
3. A method, performed by a subscription manager-discovery server (110), SM-DS, of managing mobile number portability, MNP, in a wireless communication system, the method comprising: receiving (312, 510), from a subscription manager-data preparation (108), SM-DP, server, MNP event generated based on a subscription request of user equipment (104), UE, the MNP event comprising a mobile network code, MNC, a mobile country code, MCC, a mobile station international subscriber directory number, MSISDN, and a unique porting code, UPC, to a first operator server (112);
 initiating (314, 512), based on the UPC, a mobile number portability, MNP, procedure to a second operator server;
 receiving (322, 520) from the second operator server (106), porting time information of the UE (104) determined based on the MNP procedure, after an MNP clearance and settlement is performed between the first operator server (112) and the second operator server (106);
- receiving (328, 526), from the UE (104), a message requesting completion of the subscription request; and
 transmitting (330, 528), to the second operator server (106), a request for mapping a profile generated by the SM-DP server (108) to a profile related to the first operator server (112) wherein the first operator server (112) is a donor business support system, BSS, and the second operator server is a recipient BSS (106).
4. The method of claim 3, wherein the porting time information is determined by the second operator server (106) or an MNP clearing house administrator, MCHA (202).
5. User equipment (104, 700), UE, for managing mobile number portability, MNP, in a wireless communication system, the LTE (104, 700) comprising:
 a memory (730);
 a transceiver (720); and
 at least one processor (710) connected to the transceiver (720) and configured to:
 transmit (302, 502) a request for a unique porting code, UPC, to a first operator server (112);
 receive the UPC from the first operator server (112);
 transmit (304, 504), to a second operator server (106), subscription request including a number portability indicator including a mobile network code, MNC, a mobile country code, MCC, a mobile station international subscriber directory number, MSISDN, and the UPC, wherein the subscription request is used for initiating a mobile number portability, MNP, procedure;
 receive (322, 520), from the second operator server (106), a porting time information determined based on the MNP procedure;
 delete a profile related to the first operator server (112) upon an activation (326, 524) of a subscription to the second operator server (106) and a deactivation (326, 524) of a subscription to the first operator server (112) based on the porting time information; and
 transmit (328, 526) a message requesting completion of the subscription procedure to a subscription manager-discovery server (110), SM-DS and downloading a created recipient MNO profile from a Subscription Manager-Data Preparation server, SM-DP (108), wherein the first operator server (112) is a

donor business support system, BSS, and the second operator server is a recipient BSS (106).

6. The LTE (104) of claim 5, wherein the porting time information is determined by the second operator server or an MNP clearing house administrator, MCHA (202). 5
7. A subscription manager-discovery server (110), SM-DS, for managing mobile number portability, MNP, in a wireless communication system, the SM-DS (110) comprising: 10
 - a memory; 15
 - a transceiver; and
 - at least one processor connected with the transceiver and configured to:
 - receive (312, 510), from a subscription manager-data preparation (108), SM-DP, server, MNP event generated based on a subscription request of user equipment (104), UE, the MNP event comprising a mobile network code, MNC, a mobile country code, MCC, a mobile station international subscriber directory number, MSISDN, and a unique porting code, UPC, to a first operator server; 20
 - initiate (314, 512), based on the UPC, a mobile number portability, MNP, procedure to a second operator server; 25
 - receive (322, 520) from the second operator server (106), porting time information of the UE (104) determined based on the MNP procedure, after an MNP clearance and settlement is performed between the first operator server (112) and the second operator server (106); 30
 - receive (328, 526), from the LTE (104), a message requesting completion of the subscription request; and 35
 - transmit (330, 528), to the second operator server (106), a request for mapping a profile generated by the SM-DP server (108) to a profile related to the first operator server (112) wherein the first operator server (112) is a donor business support system, BSS, and the second operator server is a recipient BSS (106). 40

Patentansprüche

1. Von einem Benutzergerät (104), UE, durchgeführtes Verfahren zur Verwaltung der Mobilfunknummerportabilität, MNP, in einem drahtlosen Kommunikationssystem, wobei das Verfahren Folgendes umfasst: 55

Übertragen (302, 502) einer Anforderung für einen eindeutigen Portierungscode, UPC, an einen ersten Betreiberserver (112);
Empfangen des UPC vom ersten Betreiberserver (112);
Übertragen (304, 504) einer Abonnementanforderung an einen zweiten Betreiberserver, die einen Nummernportabilitätsindikator enthält, der einen Mobilfunknetzcode, MNC, einen Mobilfunk-Ländercode, MCC, eine internationale Mobilstation-Teilnehmerverzeichnisnummer, MSISDN, und den UPC enthält, wobei die Abonnementanforderung zum Einleiten eines Mobilfunknummernportabilitäts-, MNP-Verfahren verwendet wird;
Empfangen (322, 520) einer Portierungszeitinformation, die auf der Grundlage des MNP-Verfahrens bestimmt wurde, von dem zweiten Betreiberserver (106);
Löschen eines Profils, das sich auf den ersten Betreiberserver (112) bezieht, bei einer Aktivierung (326, 524) eines Abonnements für den zweiten Betreiberserver (106) und einer Deaktivierung (326, 524) eines Abonnements für den ersten Betreiberserver (112) auf der Grundlage der Portierungszeitinformationen;
Übertragen (328, 526) einer Nachricht, die den Abschluss des Abonnementverfahrens anfordert, an einen Abonnementmanager-Ermittlungsserver (110), SM-DS, und Herunterladen eines Mobilfunknetzbetreiber-, MNO-, Profils von einem Abonnementmanager-Datenvorbereitungsserver, SM-DP, (108), wobei der erste Betreiberserver (112) ein Geben-Business-Support-System, BSS, ist und der zweite Betreiberserver ein Empfänger-BSS (106) ist.

2. Verfahren nach Anspruch 1, wobei die Portierungszeitinformation von dem zweiten Betreiberserver oder einem MNP-Clearing-House-Administrator (202), MCHA, bestimmt wird.
3. Verfahren, das von einem Abonnementmanager-Ermittlungsserver (110), SM-DS, durchgeführt wird, um die Mobilfunknummerportabilität, MNP, in einem drahtlosen Kommunikationssystem zu verwalten, wobei das Verfahren umfasst:

Empfangen (312, 510) eines MNP-Ereignisses, das auf der Grundlage einer Abonnementanforderung eines Benutzergeräts (104), UE, erzeugt wurde, von einem Abonnementmanager-Datenvorbereitungs- (108), SM-DP,-Server, wobei das MNP-Ereignis einen Mobilfunknetzcode, MNC, einen Mobilfunk-Ländercode, MCC, eine internationale Mobilstations-Teilnehmerverzeichnisnummer, MSISDN, und einen

- eindeutigen Portierungscode, UPC, an einen ersten Betreiberserver (112) umfasst;
 Einleiten (314, 512) eines Mobilfunknummernportabilitäts-, MNP,-Verfahrens zu einem zweiten Betreiberserver auf der Grundlage des UPC;
 Empfangen (322, 520) von Portierungszeitinformationen des UE (104), die auf der Grundlage des MNP-Verfahrens bestimmt wurden, von dem zweiten Betreiberserver (106), nachdem ein/e MNP-Clearing und -Abrechnung zwischen dem ersten Betreiberserver (112) und dem zweiten Betreiberserver (106) durchgeführt wurde;
 Empfangen (328, 526) einer Nachricht vom UE (104), die den Abschluss der Abonnementanforderung anfordert; und
 Übertragen (330, 528) einer Anforderung zum Abbilden eines vom SM-DP-Server (108) erzeugten Profils auf ein auf den ersten Betreiberserver (112) bezogenes Profil an den zweiten Betreiberserver (106), wobei der erste Betreiberserver (112) ein Geber-Business-Support-System, BSS, ist und der zweite Betreiberserver ein Empfänger-BSS (106) ist.
4. Verfahren nach Anspruch 3, wobei die Portierungszeitinformation von dem zweiten Betreiberserver (106) oder einem MNP-Clearing-House-Administrator, MCHA (202), bestimmt wird.
5. Benutzergerät (104, 700), UE, zur Verwaltung der Mobilfunknummerportabilität, MNP, in einem drahtlosen Kommunikationssystem, wobei das UE (104, 700) umfasst:
- einen Speicher (730);
 einen Transceiver (720); und
 mindestens einen Prozessor (710), der mit dem Transceiver (720) verbunden und konfiguriert ist zum:
- Übertragen (302, 502) einer Anforderung für einen eindeutigen Portierungscode, UPC, an einen ersten Betreiberserver (112);
 Empfangen des UPC vom ersten Betreiberserver (112);
 Übertragen (304, 504) einer Abonnementanforderung an einen zweiten Betreiberserver (106), die einen Nummernportabilitätsindikator mit einem Mobilfunknetzcode, MNC, einem Mobilfunk-Ländercode, MCC, einer internationalen Mobilstationsteilnehmerverzeichnisnummer, MSISDN, und dem UPC enthält,
 wobei die Abonnementanforderung zur Ein-
- leitung eines Mobilfunknummerportabilitäts-, MNP,-Verfahrens verwendet wird;
 Empfangen (322, 520) einer Portierungszeitinformation, die auf der Grundlage des MNP-Verfahrens bestimmt wurde, von dem zweiten Betreiberserver (106);
 Löschen eines auf den ersten Betreiberserver (112) bezogenen Profils bei einer Aktivierung (326, 524) eines Abonnements für den zweiten Betreiberserver (106) und einer Deaktivierung (326, 524) eines Abonnements für den ersten Betreiberserver (112) auf der Grundlage der Portierungszeitinformationen; und
 Übertragen (328, 526) einer Nachricht, die den Abschluss des Abonnementverfahrens anfordert, an einen Abonnementmanager-Ermittlungsserver (110), SM-DS, und Herunterladen eines erstellten Empfänger-MNO-Profiles von einem Abonnementmanager-Datenvorbereitungsserver, SM-DP (108),
 wobei der erste Betreiberserver (112) ein Geber-Business-Support-System, BSS, ist und der zweite Betreiberserver ein Empfänger-BSS (106) ist.
6. UE (104) nach Anspruch 5, wobei die Portierungszeitinformation von dem zweiten Betreiberserver oder einem MNP-Clearing-House-Administrator, MCHA (202), bestimmt wird.
7. Abonnementmanager-Ermittlungsserver (110), SM-DS, zum Verwalten der Mobilfunknummerportabilität, MNP, in einem drahtlosen Kommunikationssystem, wobei der SM-DS (110) umfasst:
- einen Speicher;
 einen Transceiver; und
 mindestens einen Prozessor, der mit dem Transceiver verbunden und konfiguriert ist zum:
- Empfangen (312, 510) eines MNP-Ereignisses, das auf der Grundlage einer Abonnementanforderung eines Benutzergeräts (104), UE, erzeugt wurde, von einem Abonnementmanager-Datenvorbereitungsserver (108), SM-DP, wobei das MNP-Ereignis einen Mobilfunknetzcode, MNC, einen Mobilfunk-Ländercode, MCC, eine internationale Mobilstation-Teilnehmerverzeichnisnummer, MSISDN, und einen eindeutigen Portierungscode, UPC, an einen ersten Betreiberserver umfasst;
 Einleiten, auf der Grundlage des UPC, eines Mobilfunknummerportabilitäts-MNP-Verfahrens zu einem zweiten Betreiberserver (314, 512);

Empfangen (322, 520) von Portierungszeitinformationen des UE (104), die auf der Grundlage des MNP-Verfahrens bestimmt wurden, von dem zweiten Betreiberserver (106), nachdem ein/e MNP-Clearing und -Abrechnung zwischen dem ersten Betreiberserver (112) und dem zweiten Betreiberserver (106) durchgeführt wurde; 5

Empfangen (328, 526) einer Nachricht vom UE (104), die den Abschluss der Abonnementanforderung anfordert; und 10

Übertragen (330, 528) einer Anforderung zum Abbilden eines vom SM-DP-Server (108) erzeugten Profils auf ein auf den ersten Betreiberserver (112) bezogenes Profil an den zweiten Betreiberserver (106), wobei der erste Betreiberserver (112) ein Geben-Business-Support-System, BSS, und der zweite Betreiberserver ein Empfänger-BSS (106) ist. 20

Revendications

1. Procédé, exécuté par un équipement utilisateur (104), UE, de gestion de la portabilité de numéro mobile, MNP, dans un système de communication sans fil, le procédé comprenant : 25
 - transmettre (302, 502) d'une demande de code de portage unique, UPC, à un premier serveur d'opérateur (112) 30
 - recevoir l'UPC depuis le premier serveur d'opérateur (112) ;
 - transmettre (304, 504), à un deuxième serveur d'opérateur, une demande d'abonnement comprenant un indicateur de portabilité de numéro comprenant un code de réseau mobile, MNC, un code de pays mobile, MCC, un numéro d'annuaire international d'abonné de station mobile, MSISDN, et l'UPC, la demande d'abonnement étant utilisée pour lancer une procédure de portabilité de numéro mobile, MNP ; 40
 - recevoir (322, 520), depuis le deuxième serveur d'opérateur (106), une information sur l'heure de portage déterminée sur la base de la procédure MNP ; 45
 - supprimer un profil lié au premier serveur d'opérateur (112) lors d'une activation (326, 524) d'un abonnement au deuxième serveur d'opérateur (106) et d'une désactivation (326, 524) d'un abonnement au premier serveur d'opérateur (112) sur la base des informations relatives à l'heure de portage ; 50
 - transmettre (328, 526) un message demandant l'achèvement de la procédure d'abonnement à un serveur de découverte de gestionnaire d'abonnement (110), SM-DS, et télécharger à 55

partir d'un serveur de préparation de données de gestionnaire d'abonnement, SM-DP, (108) un profil d'opérateur de réseau mobile, MNO,, dans lequel le premier serveur d'opérateur (112) est un système de soutien commercial de donneur, BSS, et le deuxième serveur d'opérateur est un BSS de receveur.

2. Procédé de la revendication 1, dans lequel les informations d'heure de portage sont déterminées par le deuxième serveur d'opérateur ou par un administrateur de chambre de compensation MNP (202), MCHA.

3. Procédé, exécuté par un serveur de découverte de gestionnaire d'abonnement (110), SM-DS, de gestion de la portabilité de numéro mobile, MNP, dans un système de communication sans fil, le procédé comprenant : 20

recevoir (312, 510), à partir d'un serveur de préparation de données de gestionnaire d'abonnement, (108), SM-DP, d'un événement MNP généré sur la base d'une demande d'abonnement de l'équipement utilisateur (104), UE, l'événement MNP comprenant un code de réseau mobile, MNC, un code de pays mobile, MCC, un numéro d'annuaire international d'abonné de station mobile, MSISDN, et un code de portage unique, UPC, à un premier serveur d'opérateur (112) ;

lancer (314, 512), sur la base de l'UPC, une procédure de portabilité de numéro mobile (MNP) vers un deuxième serveur d'opérateur ;

recevoir (322, 520) depuis le deuxième serveur d'opérateur (106), des informations d'heure de portage de l'UE (104) déterminées sur la base de la procédure MNP, après qu'un apurement et un règlement MNP ont été effectués entre le premier serveur d'opérateur (112) et le deuxième serveur d'opérateur (106) ;

recevoir (328, 526), en provenance de l'UE (104), un message demandant l'achèvement de la demande d'abonnement ; et

transmettre (330, 528), au deuxième serveur d'opérateur (106), une demande de mapper un profil généré par le serveur SM-DP (108) à un profil lié au premier serveur d'opérateur (112), dans lequel le premier serveur d'opérateur (112) est un système de soutien commercial, BSS, de donneur, et le deuxième serveur d'opérateur est un BSS de receveur.

4. Procédé de la revendication 3, l'information d'heure de portage étant déterminée par le deuxième serveur d'opérateur (106) ou par un administrateur de chambre de compensation MNP, MCHA (202).

5. Équipement utilisateur (104, 700), UE, pour gérer la portabilité de numéro mobile, MNP, dans un système de communication sans fil, l'UE (104, 700) comprenant :

une mémoire (730) ;
un émetteur-récepteur (720) ; et
au moins un processeur (710) connecté à l'émetteur-récepteur (720) et configuré pour :

transmettre (302, 502) une demande de code de portage unique (UPC) à un premier serveur d'opérateur (112) ;

recevoir l'UPC de puis le premier serveur d'opérateur (112) ;

transmettre (304, 504), à un deuxième serveur d'opérateur (106), la demande d'abonnement comprenant un indicateur de portabilité de numéro comprenant un code de réseau mobile, MNC, un code de pays mobile, MCC, un numéro d'annuaire international d'abonné de station mobile, MSISDN, et l'UPC,

la demande d'abonnement étant utilisée pour lancer une procédure de portabilité de numéro de téléphone mobile, MNP ;

recevoir (322, 520), depuis le deuxième serveur d'opérateur (106), une information d'heure de portage déterminée sur la base de la procédure MNP ;

supprimer un profil lié au premier serveur d'opérateur (112) lors d'une activation (326, 524) d'un abonnement au deuxième serveur d'opérateur (106) et d'une désactivation (326, 524) d'un abonnement au premier serveur d'opérateur (112) sur la base des informations d'heure de portage ; et

transmettre (328, 526) un message demandant l'achèvement de la procédure d'abonnement à un serveur de découverte de gestionnaire d'abonnement (110), SM-DS, et télécharger un profil MNO de destinataire créé à partir d'un serveur de préparation de données de gestionnaire d'abonnement, SM-DP (108),

dans lequel le premier serveur d'opérateur (112) est un système de soutien commercial de donneur, BSS, et le deuxième serveur d'opérateur est un BSS de receveur.

6. UE (104) de la revendication 5, l'information d'heure de portage est déterminée par le deuxième serveur d'opérateur ou par un administrateur de chambre de compensation MNP, MCHA (202).

7. Serveur de découverte de gestionnaire d'abonnement (110), SM-DS, pour gérer la portabilité de nu-

méro mobile, MNP, dans un système de communication sans fil, le SM-DS (110) comprenant :

un souvenir ;

un émetteur-récepteur ; et

au moins un processeur connecté à l'émetteur-récepteur et configuré pour :

recevoir (312, 510), depuis un serveur de préparation de données de gestionnaire d'abonnement, (108), SM-DP, serveur, l'événement MNP généré sur la base d'une demande d'abonnement de l'équipement utilisateur (104), UE, l'événement MNP comprenant un code de réseau mobile, MNC, un code de pays mobile, MCC, un numéro d'annuaire international d'abonné de station mobile, MSISDN, et un code de portage unique, UPC, vers un premier serveur d'opérateur... ;

lancer (314, 512), sur la base de l'UPC, une procédure de portabilité de numéro mobile (MNP) vers un deuxième serveur d'opérateur ;

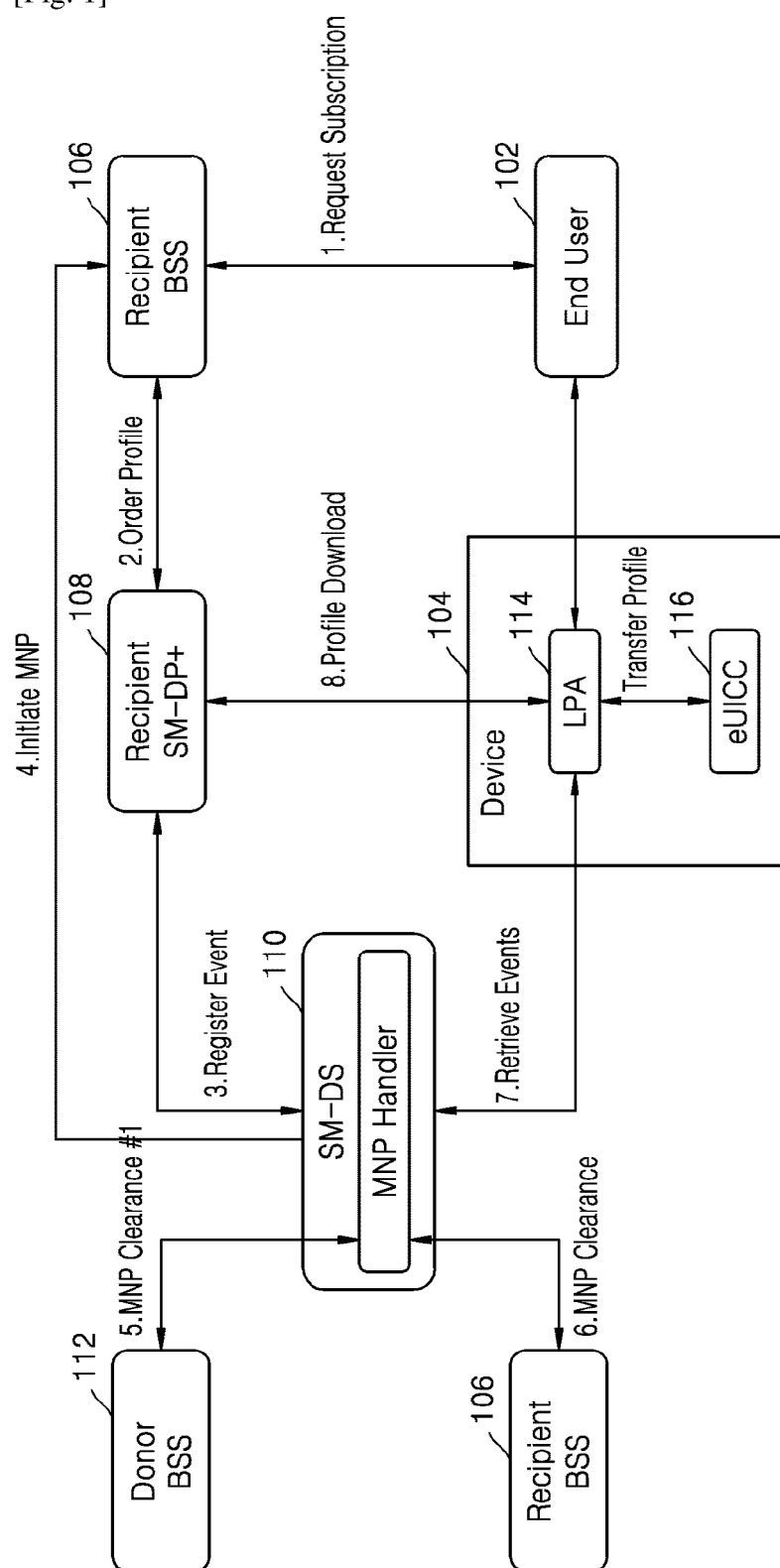
recevoir (322, 520) depuis le deuxième serveur d'opérateur (106), des informations d'heure de portage de l'UE (104) déterminées sur la base de la procédure MNP, après qu'un apurement et

un règlement MNP ont été effectués entre le premier serveur d'opérateur (112) et le deuxième serveur d'opérateur (106) ;

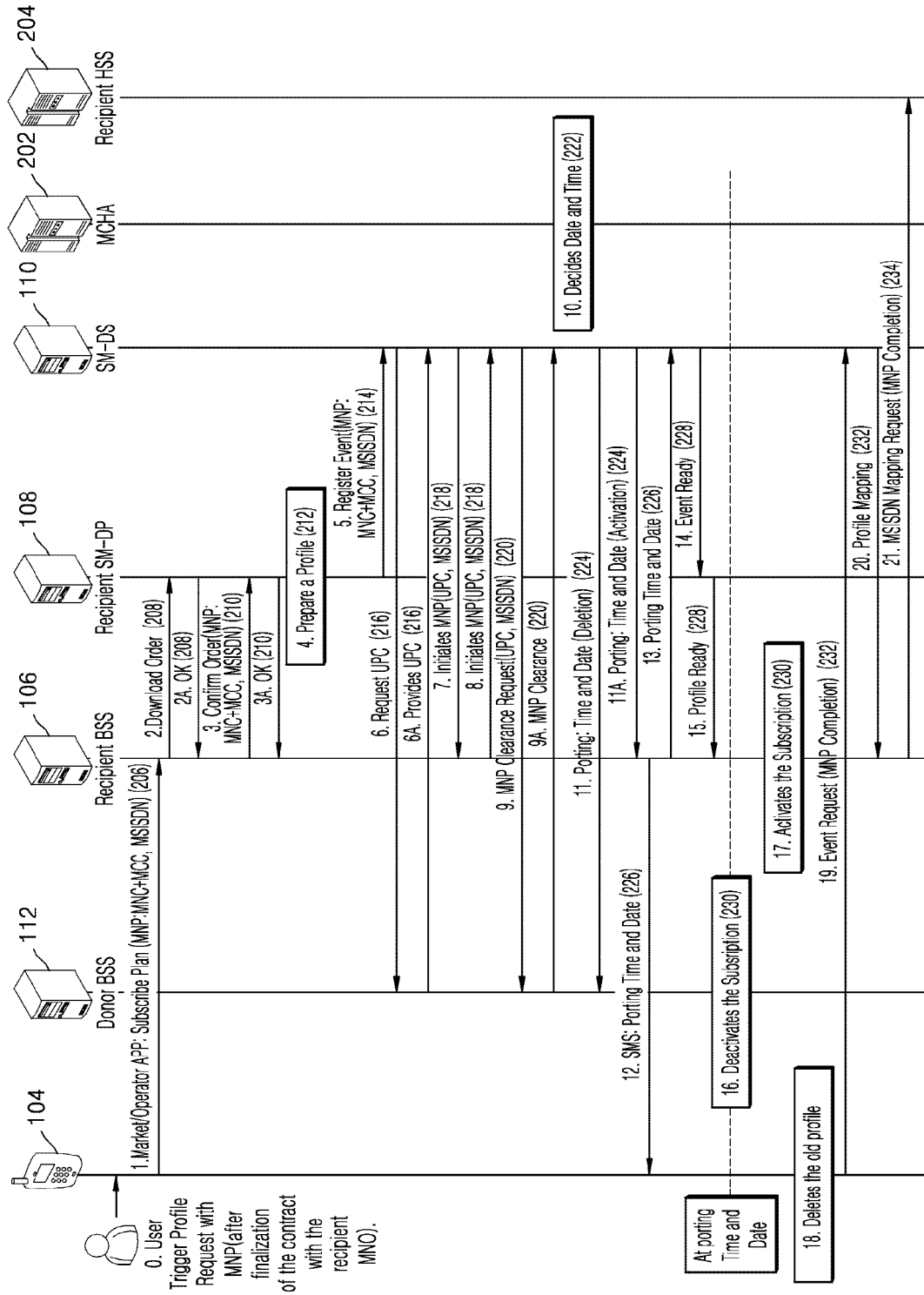
recevoir (328, 526), depuis l'UE (104), un message demandant l'achèvement de la demande d'abonnement ; et

transmettre (330, 528), au deuxième serveur d'opérateur (106), une demande de mapper un profil généré par le serveur SM-DP (108) à un profil lié au premier serveur d'opérateur (112), dans lequel le premier serveur d'opérateur (112) est un système de soutien commercial, BSS, de donneur, et le deuxième serveur d'opérateur est un BSS de receveur.

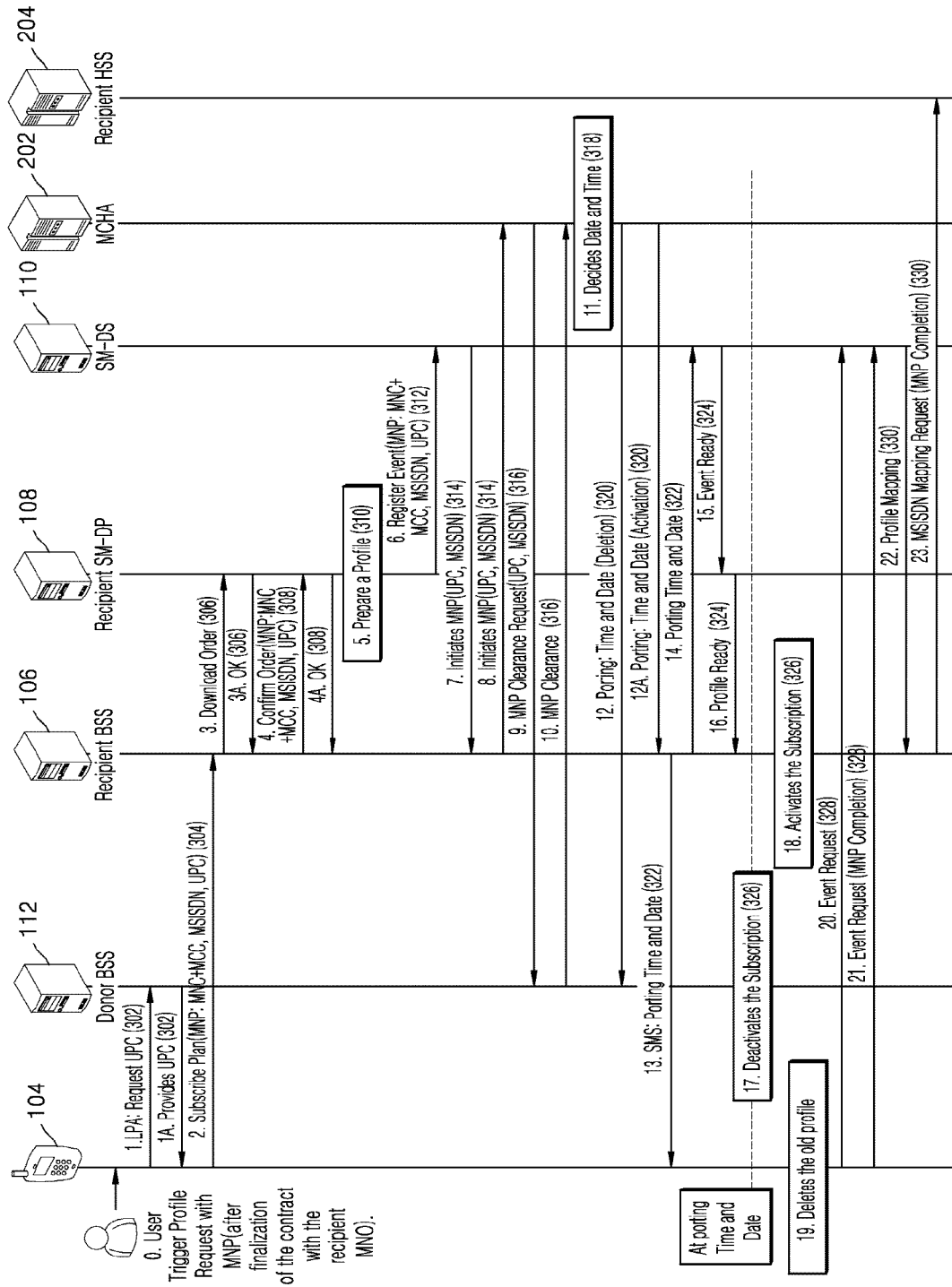
[Fig. 1]



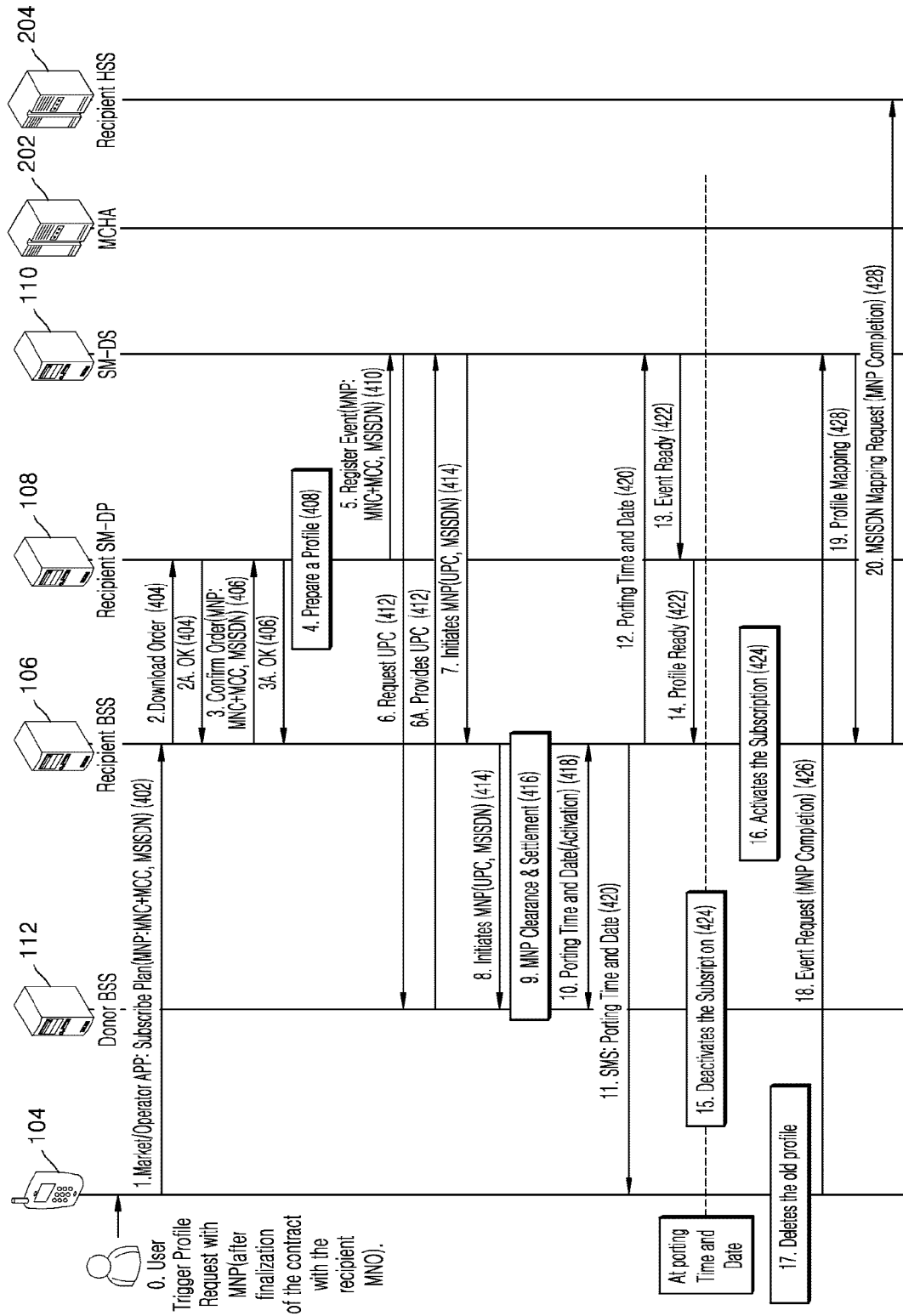
[Fig. 2]



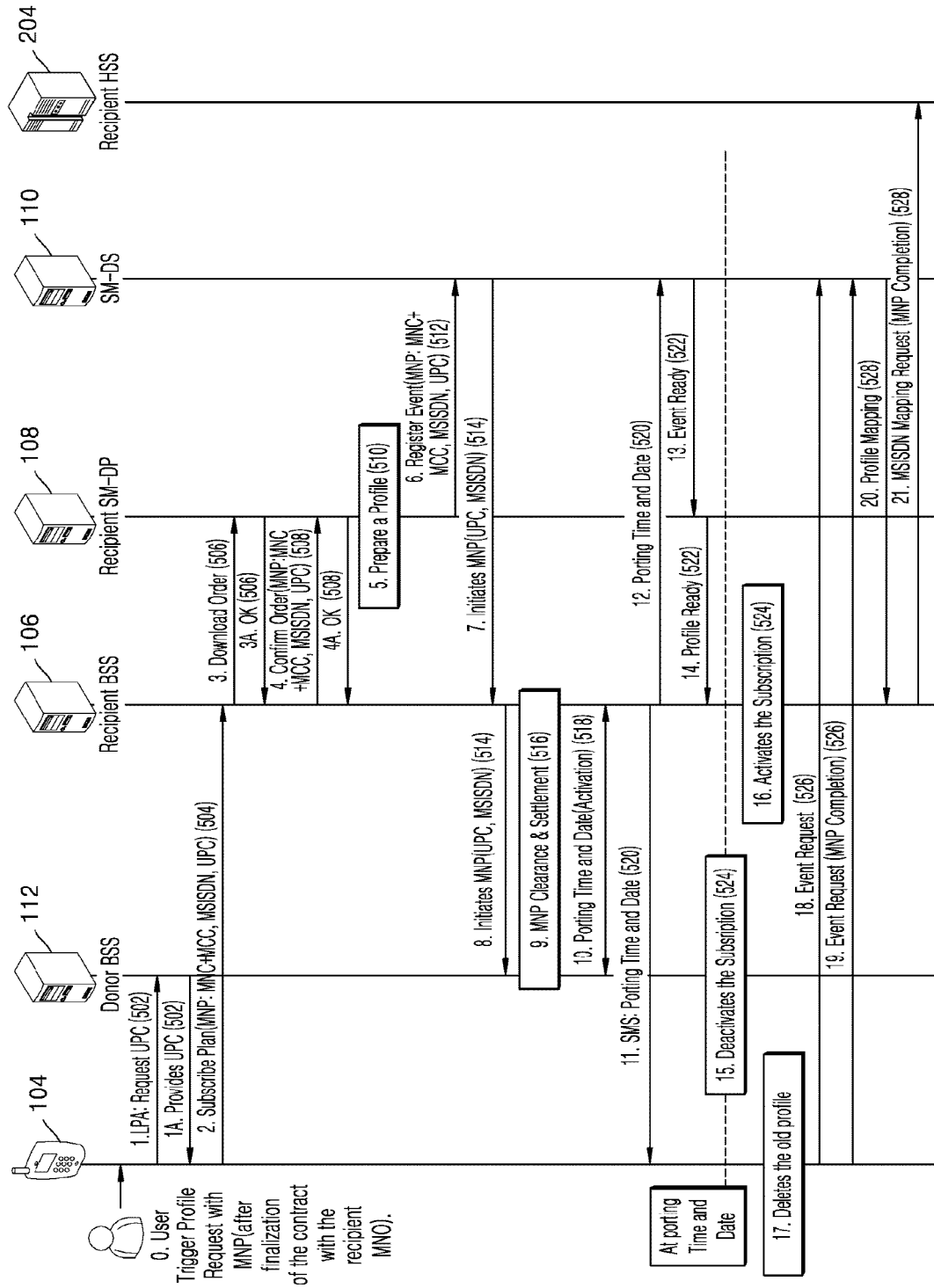
[Fig. 3]



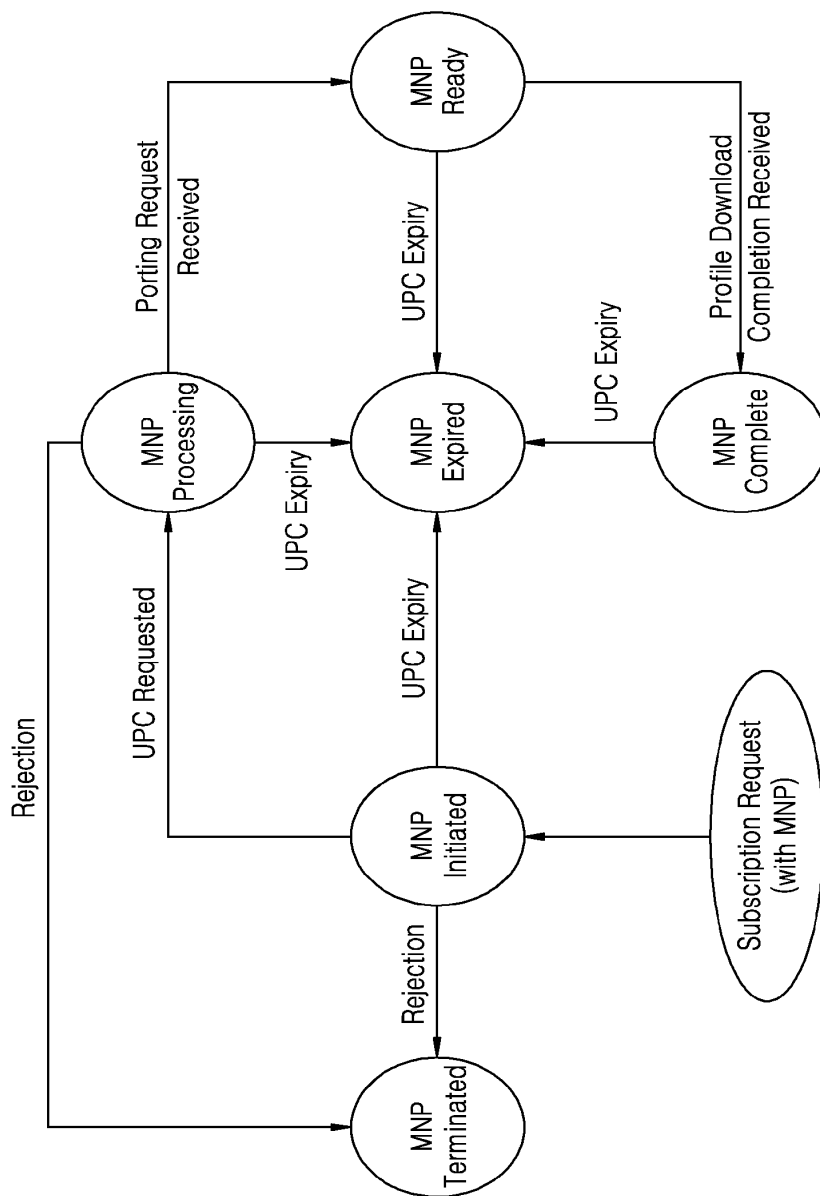
[Fig. 4]



[Fig. 5]



[Fig. 6]



[Fig. 7]

